



A.D. 1858, 27th OCTOBER. N° 2398.

S P E C I F I C A T I O N

OF

THOMAS ALMOND.

FURNACES FOR THE COMBUSTION OF SMOKE.

L O N D O N :

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A.D. 1858, 27th OCTOBER. N° 2398.

Furnaces for the Combustion of Smoke.

LETTERS PATENT to Thomas Almond, of 22, Pickering Place, Paddington, in the County of Middlesex, Engineer, for the Invention of “**IMPROVEMENTS IN FURNACES FOR THE BETTER COMBUSTION OF SMOKE.**”

Sealed the 5th April 1859, and dated the 27th October 1858.

PROVISIONAL SPECIFICATION left by the said Thomas Almond at the Office of the Commissioners of Patents, with his Petition, on the 27th October 1858.

I, THOMAS ALMOND, of 22, Pickering Place, Paddington, in the County of Middlesex, Engineer, do hereby declare the nature of the said Invention for “**IMPROVEMENTS IN FURNACES FOR THE BETTER COMBUSTION OF SMOKE,**” to be as follows:—

I place a partition or diaphragm in the fire box or furnace chamber, which partially divides the front part from the back part next the tubes. This
10 partition is formed of a water space having through tubes or smoked channels. Space and passage is provided from the fire over the top, as also underneath this partition; and I prefer to place it at an incline, so as to be nearly in a line with the angles of the fire-box. On the side of this partition next the tubes I place a number of hollow fire tiles, which lie with the hollow side
15 against the water partition, and being made in short lengths, are placed one above the other, and form continuous channels from the lower to the upper

Almond's Improvements in Furnaces for the better Combustion of Smoke.

part of the partition, which receive and conduct the products of combustion passing below it and through the tubes or passages therein. A series of such inclined channels are formed throughout the breadth of the fire-box, so as to receive the products of combustion all the way across. Immediately on these fire-clay flues I lay a second series of tiles of like construction, which form 5 also a series of channels abutting against the flue channels; these latter are for the passage of air admitted through the fire-box under the body of the boiler, or at other suitable positions. The air inlets are furnished with slides or regulators to regulate the supply of air admitted. The air in passing up through the fire-tile channels becomes heated, and is emitted into the fire-box 10 in close proximity to the products of combustion, passing up through the channels before mentioned or over the partition, and mingles therewith, causing the combustion of the smoke. Cold air may be otherwise admitted to the fire-box, if necessary. In some cases fire-boxes have water partitions, which, if necessary, I place nearer the fire door, and introduce my partition 15 and other parts behind such ordinary partition.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Thomas Almond in the Great Seal Patent Office on the 27th April 1859.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, THOMAS 20 ALMOND, of 22, Pickering Place, Paddington, in the County of Middlesex, Engineer, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-seventh day of October, in the year of our Lord One thousand eight hundred and fifty-eight, in the twenty-second year of Her 25 reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Thomas Almond, Her special licence that I, the said Thomas Almond, my executors, administrators, and assigns, or such others as I, the said Thomas Almond, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter 30 during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for “**IMPROVEMENTS IN FURNACES FOR THE BETTER COMBUSTION OF SMOKE,**” upon the condition (amongst others) that I, the said Thomas Almond, my executors or 35

Almond's Improvements in Furnaces for the better Combustion of Smoke.

administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six
5 calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Thomas Almond, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following
10 statement, reference being had to the two Sheets of Drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):—

According to my Invention, I place a partition or diaphragm in the fire-box or furnace chamber, which partially divides the front part from the part next the tubes in locomotive boilers. This partition is formed of a water space
15 having through holes or smoke channels, space and passage being provided from the fire over the top; and it may be also underneath this partition. I prefer to place this partition at an incline, so as to be nearly in a line with the angles of the fire-box. On the side of this partition next the tubes I place a number of hollow fire tubes, which lie with the hollow side against the
20 water partition, and being made in short lengths, are placed one above the other to form continuous channels from the lower to the upper part of the partition; these channels receive and conduct the products of combustion passing below the partition and through the tubes or passages in it before mentioned. A series of such inclined channels are formed throughout the
25 breadth of the fire-box, so as to receive the products of combustion all the way across. Immediately on these fire-clay flues or channels I lay a second series of tubes of like construction, which form also a series of channels abutting and resting against the flue channels; these latter are for the passage of air admitted from the exterior through the fire-box at a point under the body of
30 the boiler or at other suitable position. The air inlets are furnished with slides or regulators to regulate the supply of air admitted. The air in passing up through the fire-tile channels becomes heated, and is emitted into the fire-box in close proximity to the products of combustion, passing up through the channels before mentioned, or over the partition, with which it mingles,
35 thereby causing the combustion of the smoke. Cold air may be otherwise admitted to the fire-box, if necessary. In some cases fire-boxes have water partitions, which, if necessary, I place nearer the fire door, and introduce my partition and other parts behind such ordinary partition; but I prefer to dispense with such ordinary partitions altogether.

Almond's Improvements in Furnaces for the better Combustion of Smoke.

DESCRIPTION OF DRAWINGS.

Fig. 1 represents a longitudinal vertical section of the fire-box of a locomotive engine furnished with parts according to my Invention; Fig. 2 is a view of the exterior shell of the fire-box under the body of the boiler, showing the apertures of admission for the air, while Figs. 3, 4, 5, and 6 are parts in detail, Fig. 3 being a face view of the partition in the fire-box, arranged according to my Invention; Fig. 4, a horizontal section through the partition and sides of the fire-box; and Figs. 5 and 6, plan and end view of one of the fire tiles forming the air and smoke channels at the back of the partitions. The partition A, A, I form and connect with the fire-box in the manner of ordinary water spaces or partitions therein, with this difference: I form flue tubes or channels *a, a*, through such water space or partition, as seen in the side view, Fig. 3, of it; this partition I connect at the sides as seen, and across the breadth of the fire-box at the bottom. On the upper surface or that next the flue or tubes, I place the fire-clay tiles B, B, (see Figs. 5 and 6,) so as to form a series of continuous channels *b, b*, from bottom to top of the partition A. A second series of tiles B are placed on the first series to form channels *c, c*, across the breadth of the fire box. The first series of channels *b, b*, receives the products of combustion passing through holes *a, a*, and conducting such products to the upper part of the fire-box. The channels *c, c*, are open to the atmosphere at bottom, being in communication with air passages *i, i*, which allows greater or less inflow of air, according as it may be regulated by the slide D. The air admission apertures *i, i*, consist of tubes passing through the fire-box, and except when covered by the slide D are open to the atmosphere. The slide D consists of a perforated plate, the tubes *i, i*, being so arranged that the holes in plate D coincide with the tubes, and permit free ingress of air to channels *c, c*; also so that by a slight motion in the direction of the length of the plate it covers and closes the tubes *i*, or regulates the extent of the opening. The plate *d* is mounted in suitable guides, and is connected with an arm *e* fixed on an upright shaft *f*, shown dotted, and communicating with a pull handle or lever, by which the driver actuates the slide D, as may be required. As before mentioned, the products of combustion enter and ascend in the channels *b*, while air ascends in the channels *c*. The heat imparted to the fire tubes by the products of combustion is transmitted to the air passing up channels *c, c*, which becomes thoroughly heated before reaching the top; the products of combustion and the air so ascending are distributed evenly in two films, the air being at a temperature suitable for combustion. The products of combustion and air

Almond's Improvements in Furnaces for the better Combustion of Smoke.

thus escaping at *x*, mingle and mix intimately together, as also with the air and products passing over the top of partition A, producing combustion of the smoke or products of combustion arising in the fire-box. These products of combustion are thus caused to be rapidly consumed in their passage through
5 the tube flues of the boiler, thereby enhancing the effect of those products in the evaporation of water in the boiler, and this the more especially when coals are consumed in the fire-box. The driver regulates the admission of air according as he may find it best adapted for the consumption of the smoke. The air entering and passing up the channels is also much heated by heat
10 transmitted through the tiles from that side next the boiler tubes. I place the whole of the fuel in the fire-box on that side of the partition next the fire door. Instead of placing the partition A in the position represented, it may be differently disposed so long as the channels are provided as and for the purpose described. The fire tiles also may be differently formed, but I prefer the form
15 represented, as being easy of manufacture, and well adapted for the purpose. I have represented the partition as being of a curved form across the top, which may, however, be straight; but I prefer it as represented, as it somewhat protects the upper part of A from wear.

Fig. 7, Sheet 1, represents a longitudinal vertical section of a locomotive
20 fire-box, furnished with parts according to my Invention, in which the ordinary partition G is inserted in the fire-box; this I incline a little forwards to render the feeding of the fire easier; I, however, prefer to dispense with it altogether, and as before described.

Fig. 8 represents a side view of partition A; and Fig. 9, a side view of the
25 ordinary partition G in partition A, Figs. 7 and 8; I have formed it so as to allow of passage underneath for the products of combustion to ascend the channels *b, b*, together with those passing through tubes *a, a*. All the other arrangements are in every respect as before described.

Fig. 10, Sheet 2, represents a longitudinal vertical section of a marine
30 boiler furnished and arranged according to my Invention; Fig. 11 represents a back view, and Fig. 12 a transverse section of the same, as applied to a single fire in such boilers. F are the fire-bars as usual, the space between which and the upper surface of the furnace chambers may be increased beyond that in ordinary, to permit of the introduction of the water space or partition A,
35 which in this case, it will be observed, is somewhat horizontal, the fire being underneath.

Fig. 14 represents a plan of this partition detached; it has flue passages *a, a*, as before, as also the fire tile channels *b* and *c*, the air inlets *i*, and regulating slide D, all as before explained, the products of combustion passing

Almond's Improvements in Furnaces for the better Combustion of Smoke.

through the holes *a* or up in front of the partition A, mix with the heated air at *x*, and produce the combustion of the smoke as required in its passage through the flues and tubes to the uptake, and the uptake and the chimney. The same letters of reference are used where the parts recur in the different Figures; it will therefore be unnecessary to repeat the individual description 5 and use of such parts.

Fig. 13, Sheet 2, represents a section of a Cornish or flue boiler for stationary engines arranged and furnished with parts according to my Invention. F, F, the fire-bars; H, a water bridge, which I erect of a suitable height, or it may be a brick bridge. I connect the partition A with this 10 water bridge, and arrange the fire-tile channels *b*, *c*, all as before explained in the water bridge H. I form through tiles or air inlets *i* in connection with the air channels *c*. I conduct the external air to passages *i*, *i*, by a tube I, the entrance of which is furnished with a suitable regulating slide, as before. The plan, Fig. 14, represents also the plan of water space or partition in this 15 boiler.

The action and effect of the introduction of this water space partition besides the increase of surface is, as before described, with reference to the other boilers mentioned.

Having described the nature of my Invention, and the manner of per- 20 forming the same, I declare that what I claim as my Invention to be protected by the herein-before in part recited Letters Patent is, the introduction of a water space A in combination with flue and air channels *a* and *b*, into fire-boxes or furnaces, in manner and for the purpose herein-before described.

In witness whereof, I, the said Thomas Almond, have hereunto set my 25 hand and seal, this Twentieth day of April, in the year of our Lord One thousand eight hundred and fifty-nine.

THOMAS ALMOND. (L.S.)

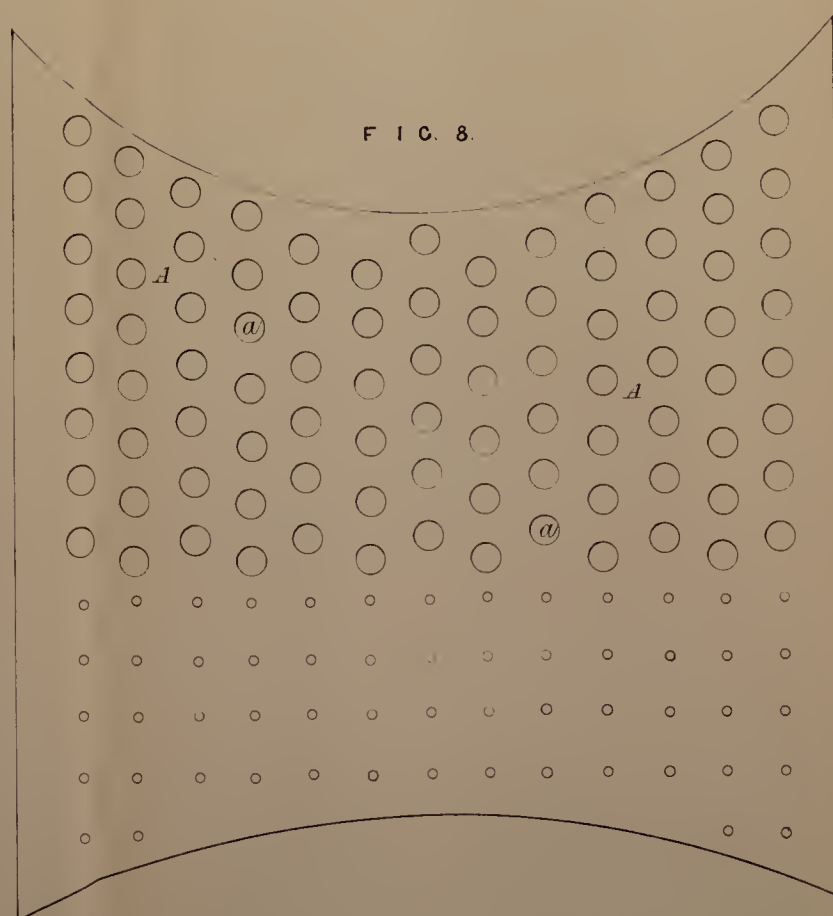
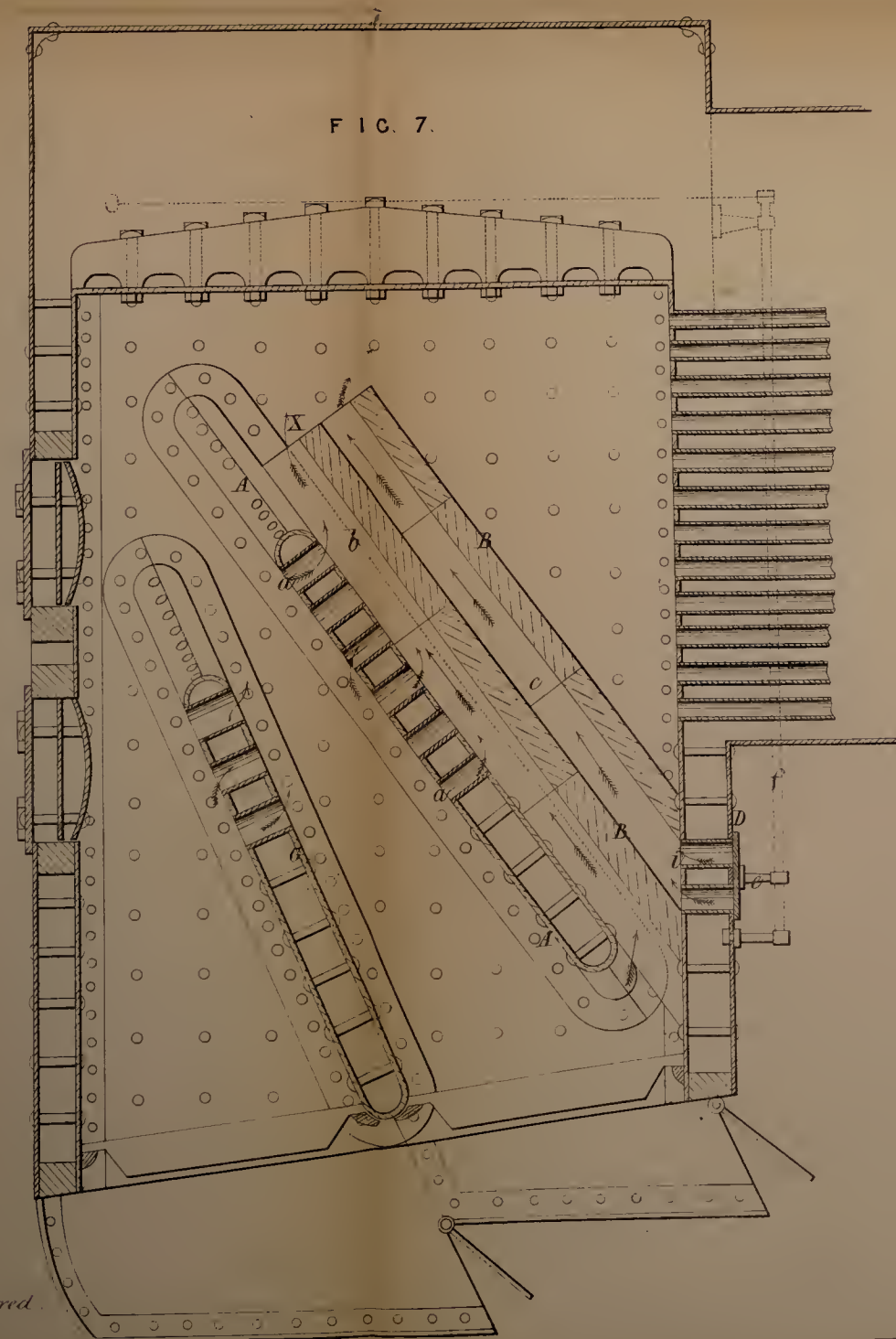
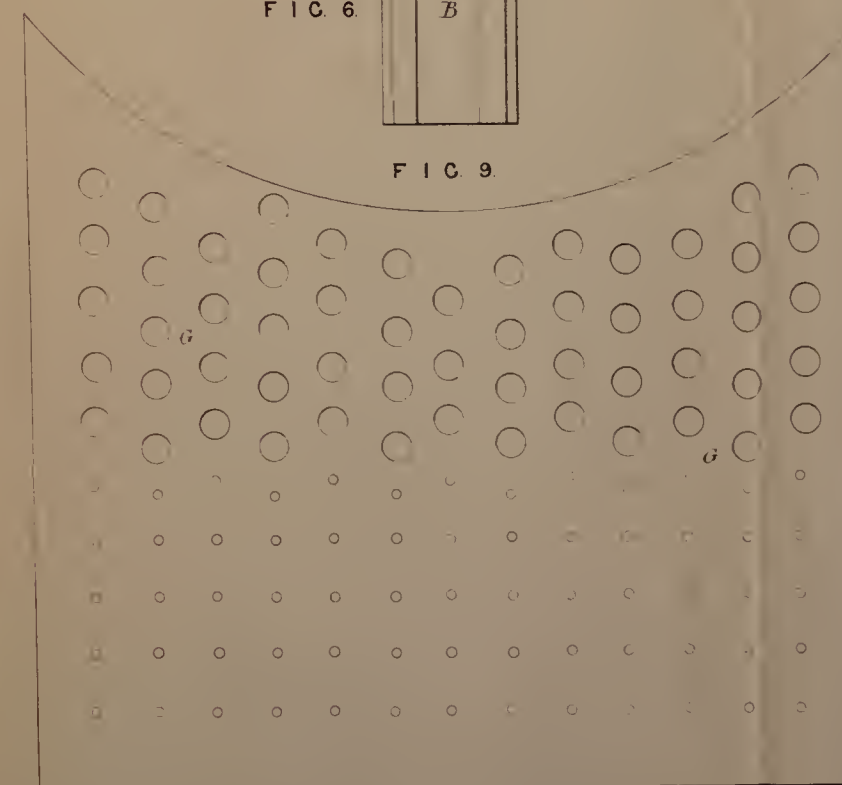
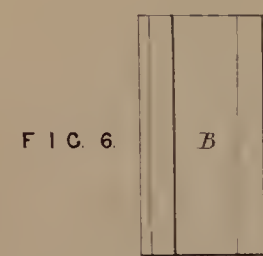
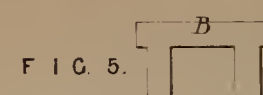
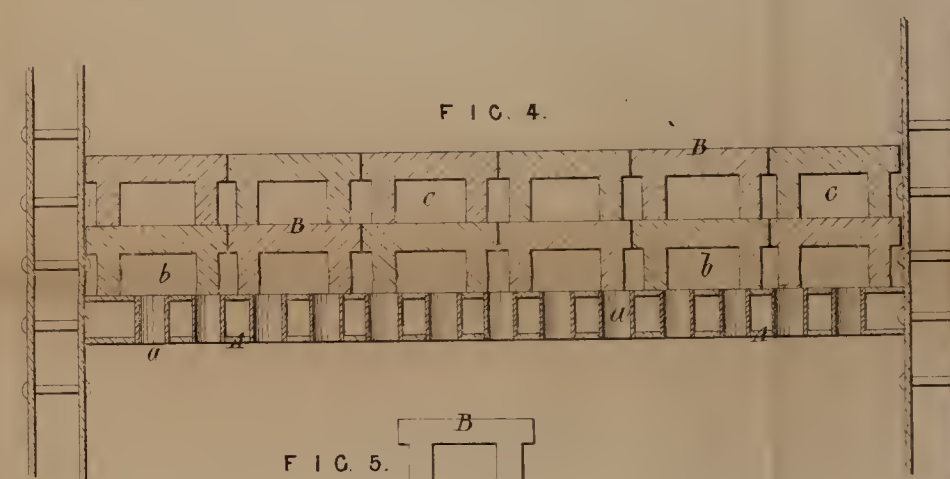
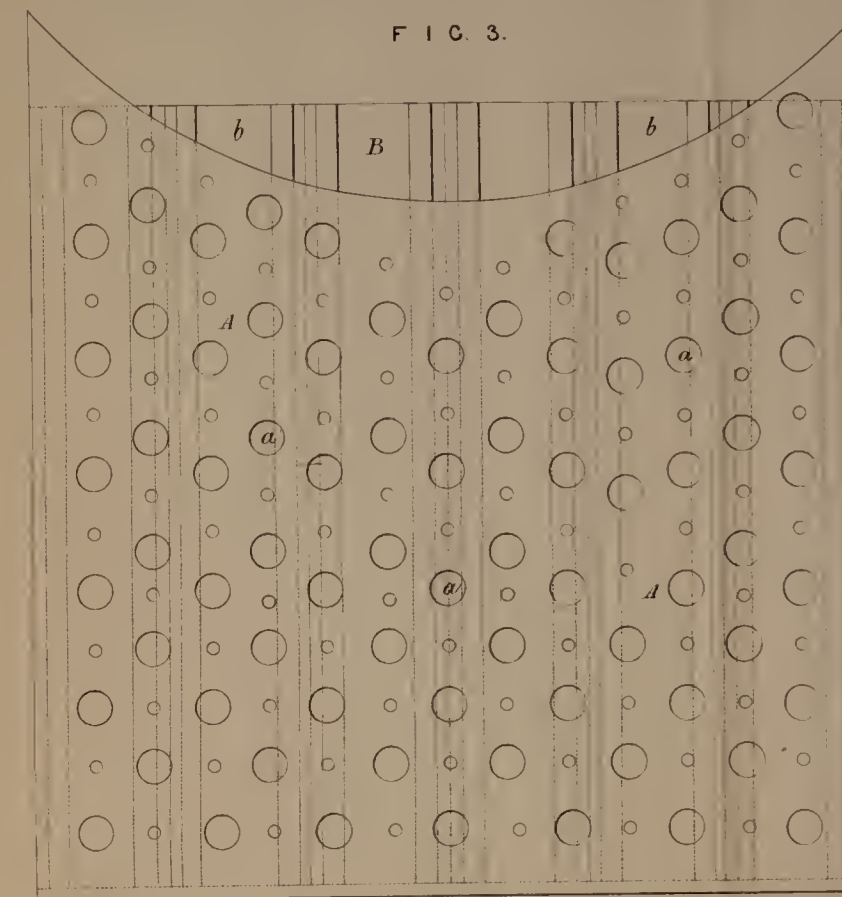
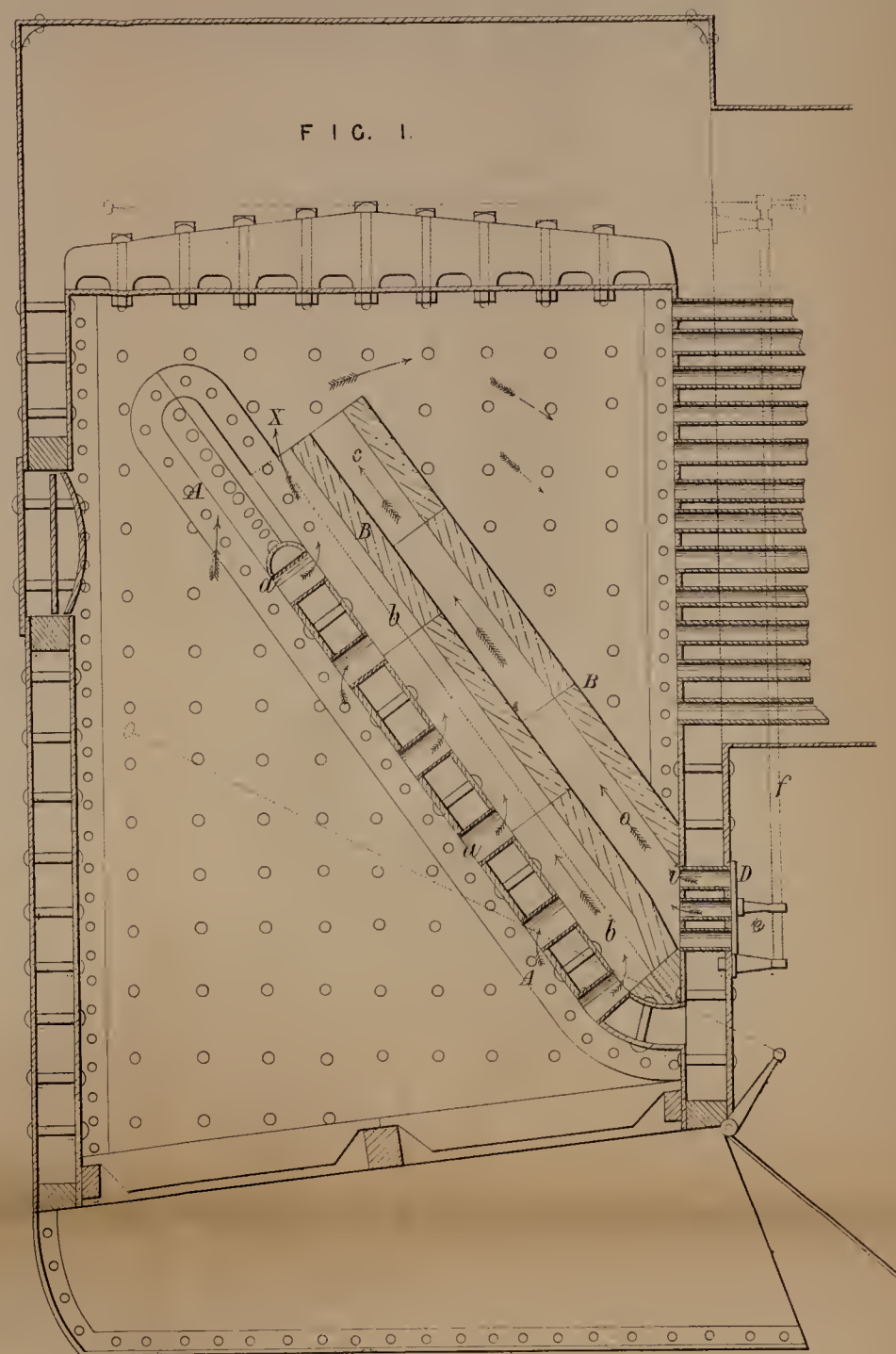
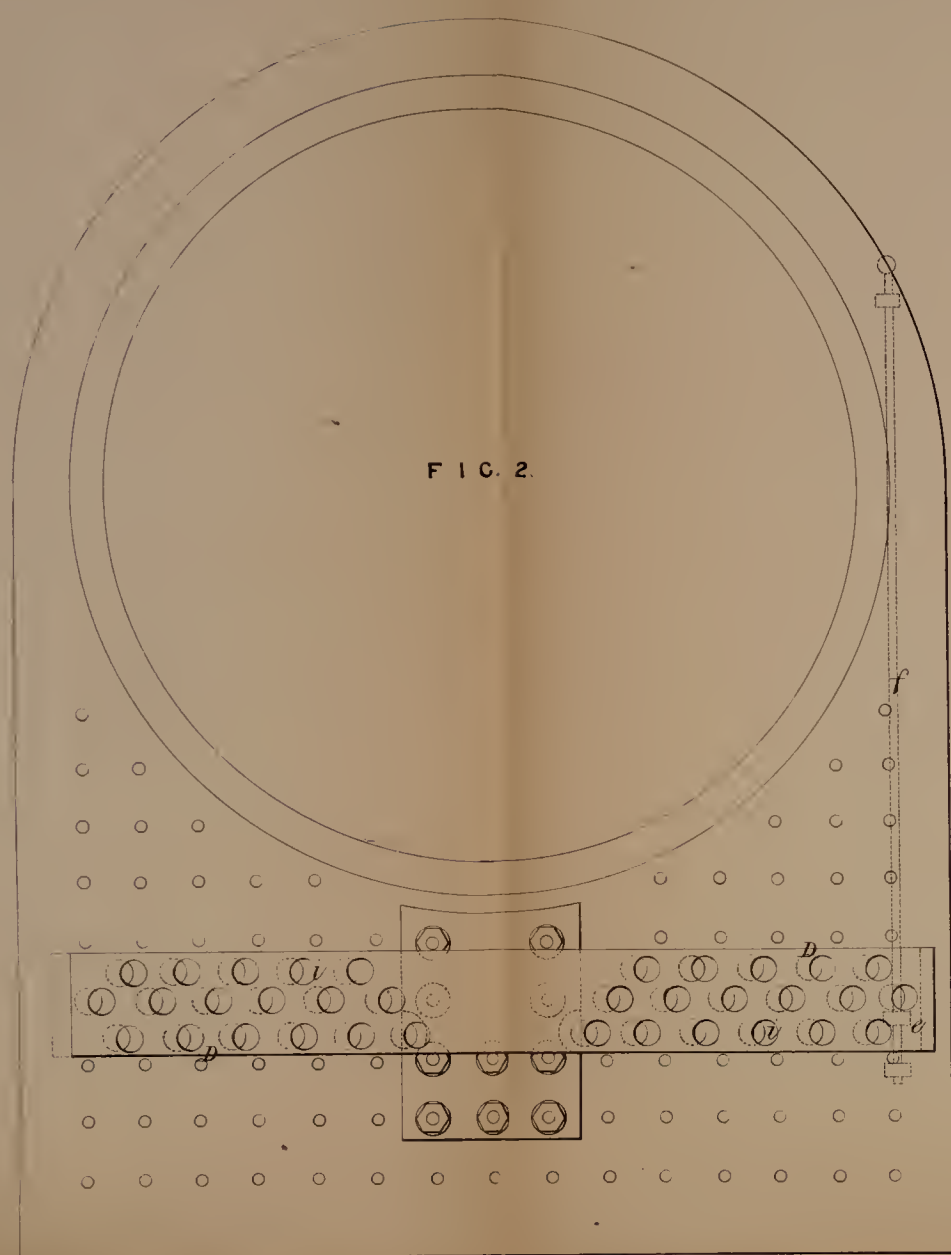
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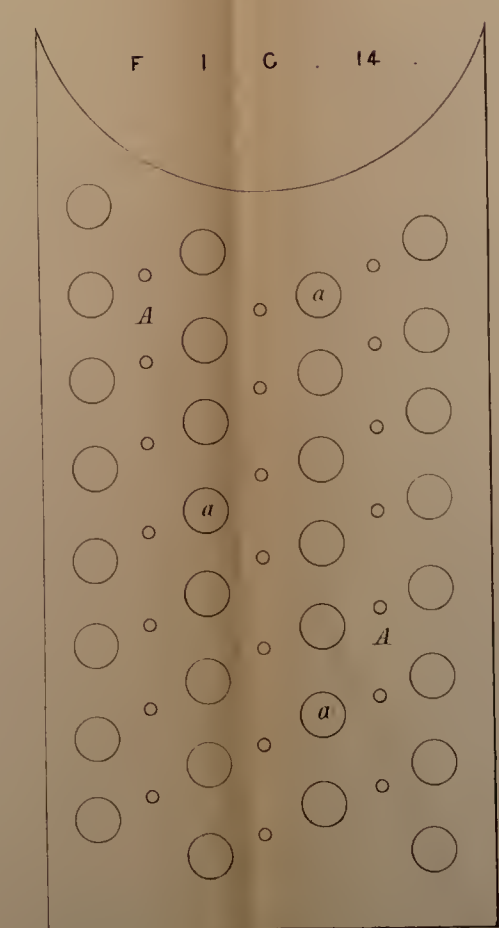
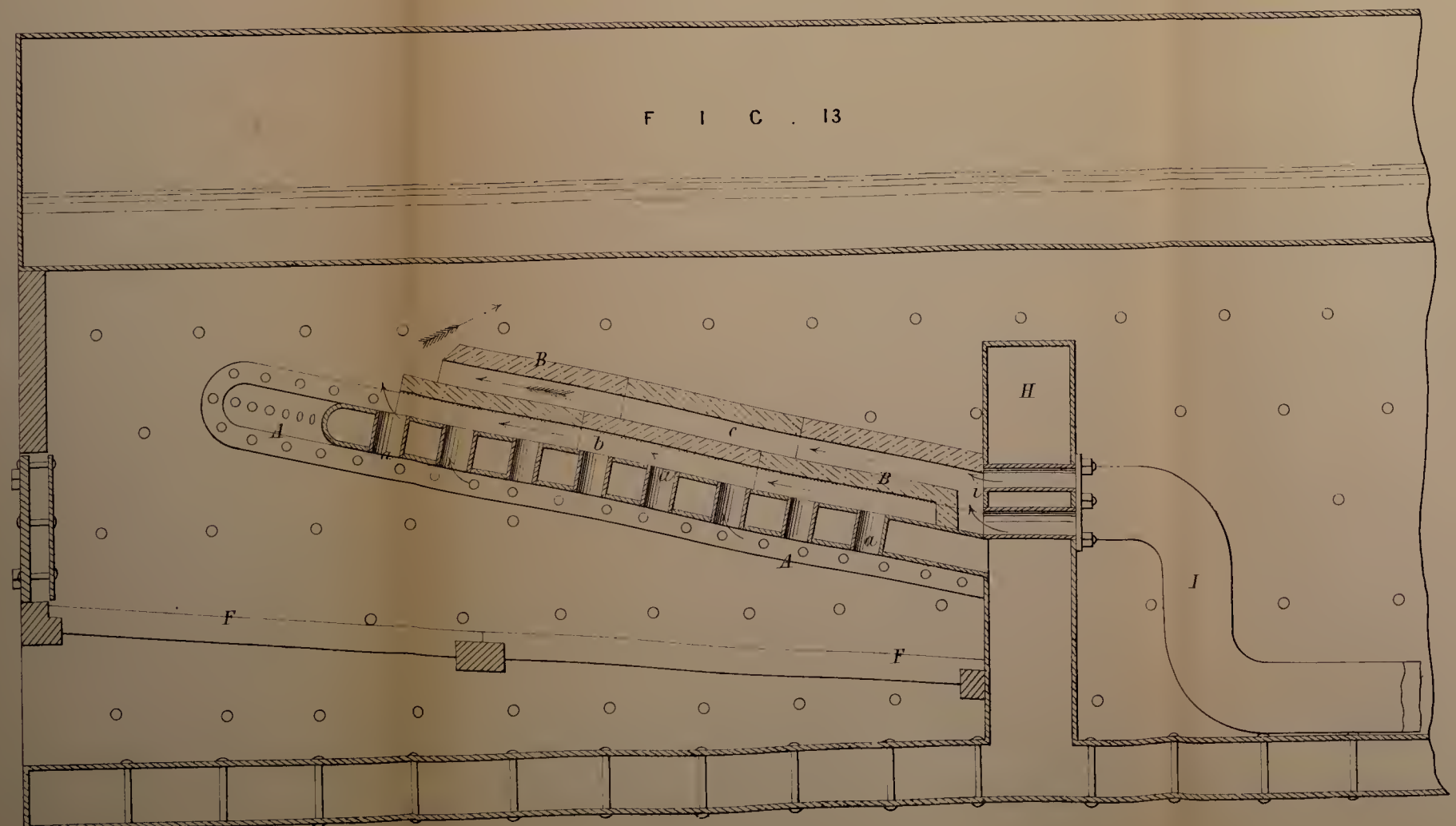
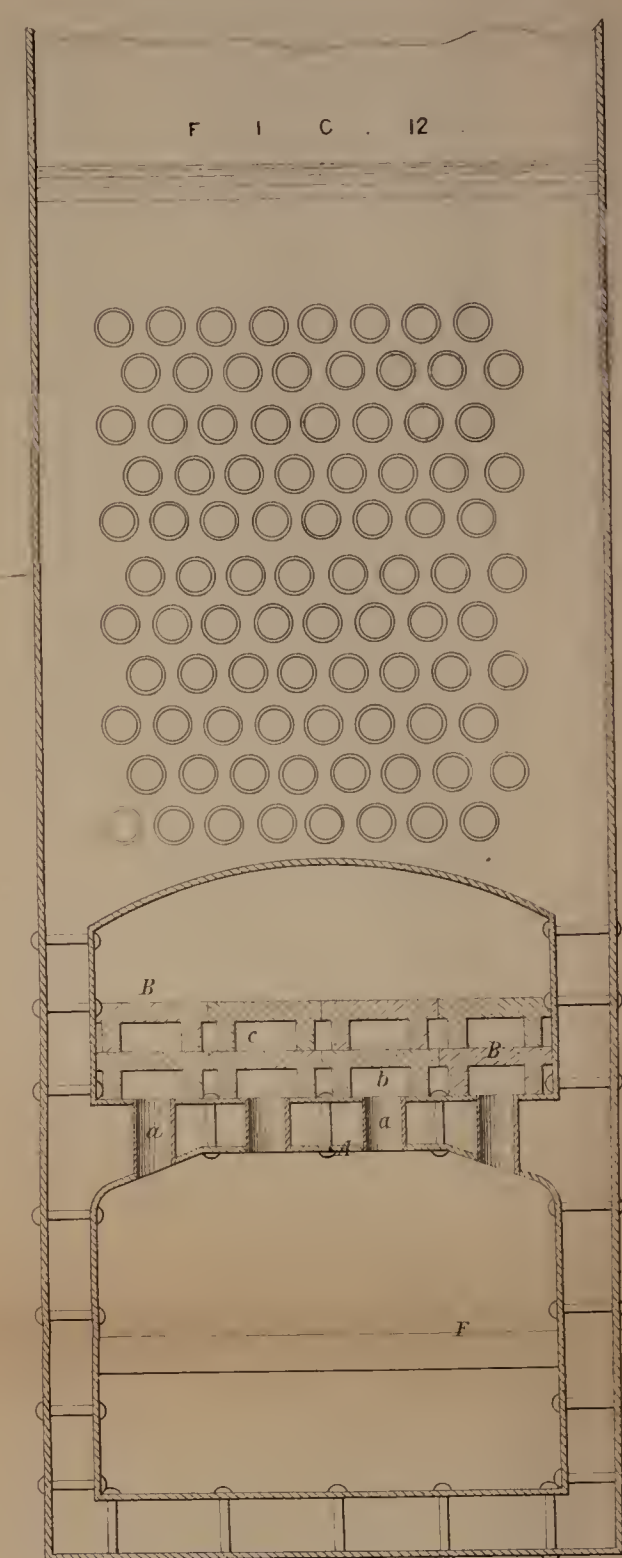
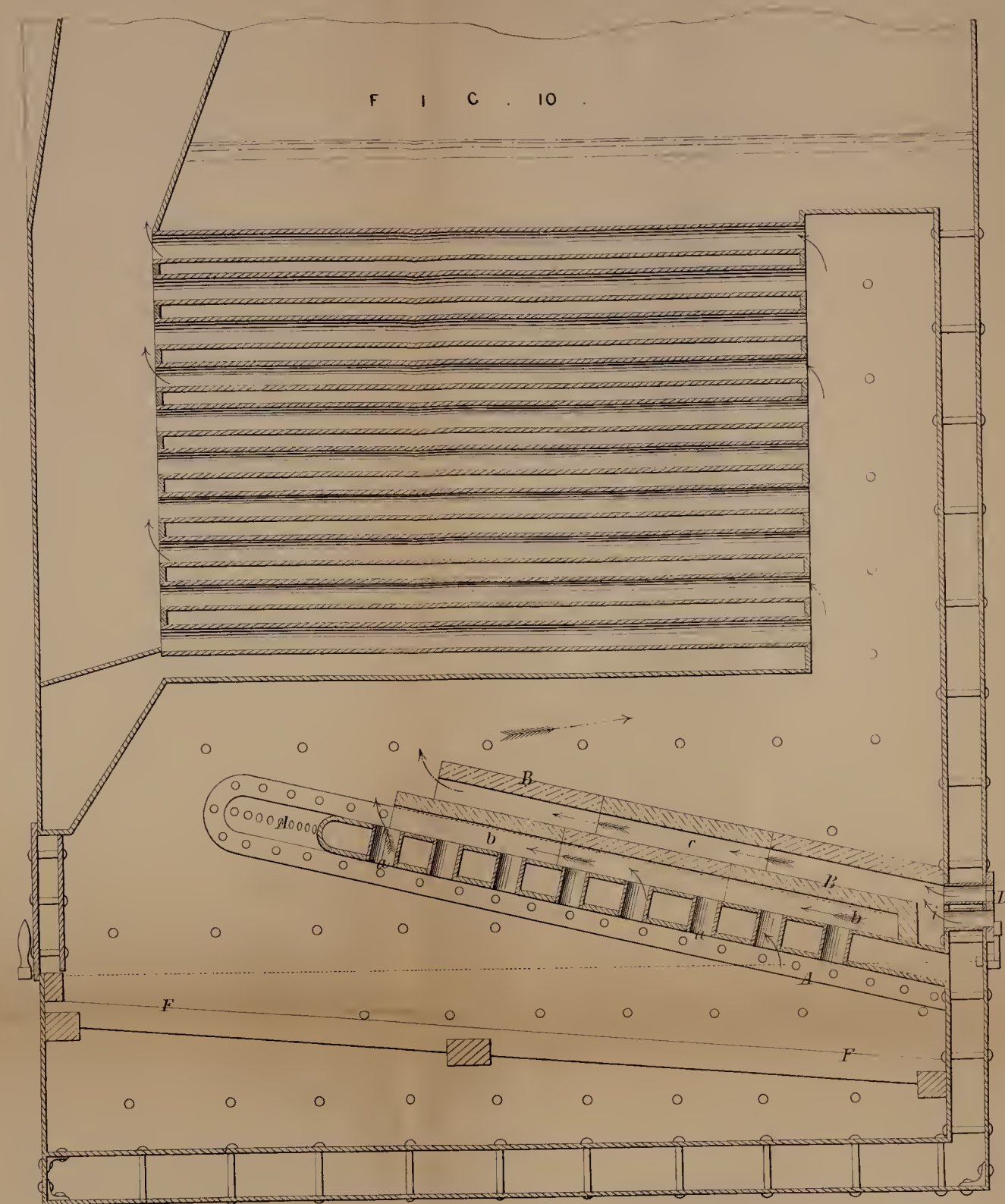
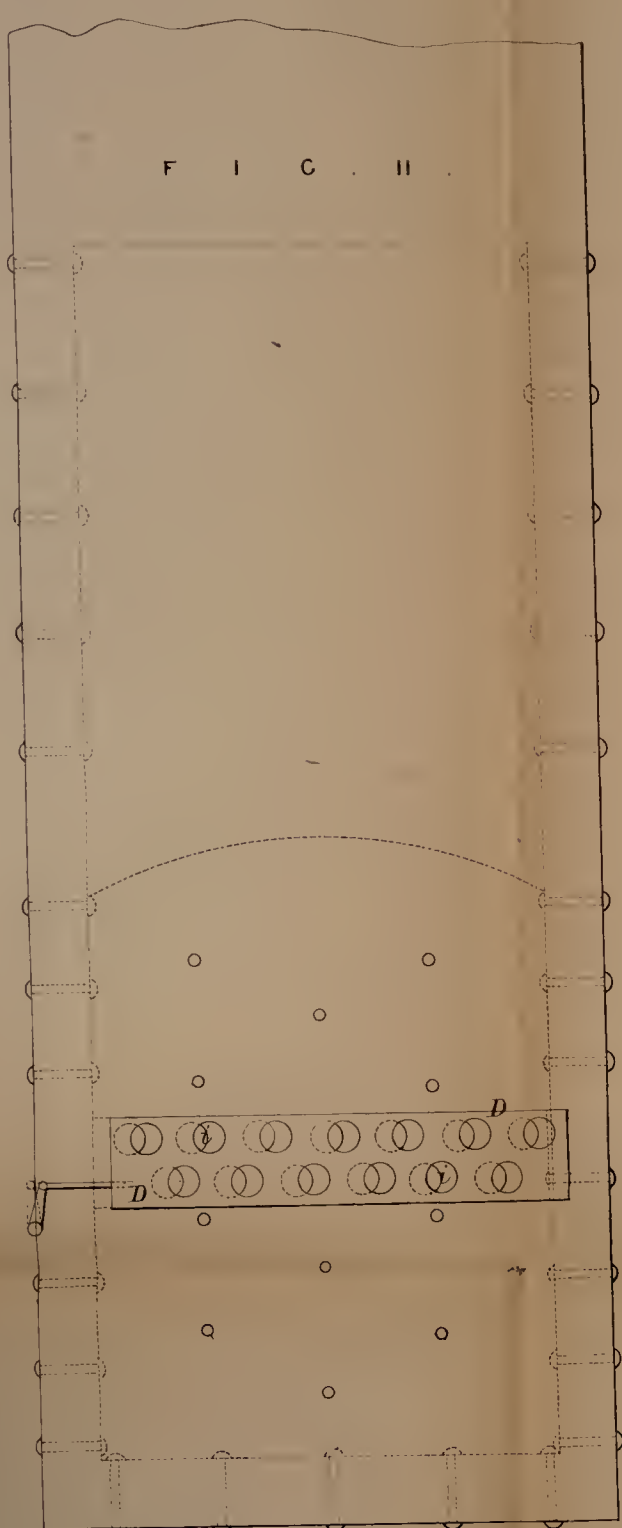
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The steel drawing is partly colored

Drawn on Stone by Maitly & Co.

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ALMOND'S SPECIFICATION.



The filed drawing is partly colored.

